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Huang

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(54) **AUTO ELECTRICITY BREAKER FOR SHREDDERS**

(75) Inventor: **Simon Huang**, SanChung (TW)

(73) Assignee: **Michilin Prosperity Co., Ltd.**, San Chung, Taipei Hsien (TW)

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(51) **Int. Cl.**
B02C 18/06 (2006.01)
B02C 18/24 (2006.01)

(52) **U.S. Cl.** **241/33**; 241/36; 241/37.5

(58) **Field of Classification Search** 241/33, 241/36, 37.5
See application file for complete search history.

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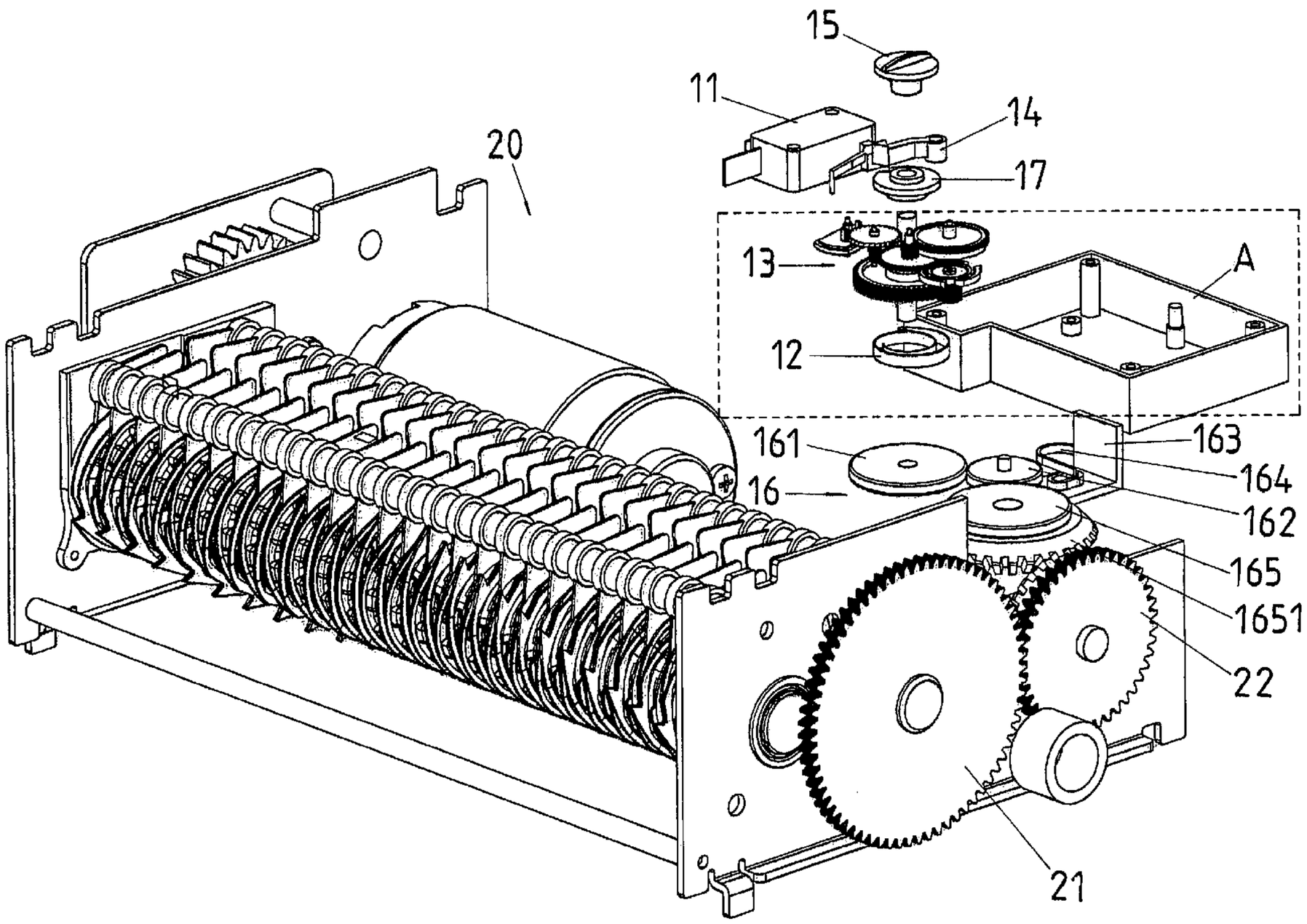
Primary Examiner—Ramon M Barrera
(74) *Attorney, Agent, or Firm*—Bacon & Thomas, PLLC

(57) **ABSTRACT**

An auto electricity breaker includes a breaker switch, an energy storage device driven by a cutting blade ensemble, a variable gear set driven by the energy storage device, a trigger driven by the variable gear set to turn on the breaker switch, and a starting switch for restoring the trigger. The energy storage device stores energy concurrently during the operation of the cutting blade ensemble. When the cutting blade ensemble stops operation, the variable gear set is driven to operate. When the variable gear set operates to a certain extent, the trigger takes action to turn on the breaker switch. The breaker switch breaks the electrical power of the shredder to stop its operation. The user can turn on the starting switch for restoring the trigger and thus turn on the power of the shredder again for normal operation. The breaker then resumes its auto electricity breaker function.

8 Claims, 9 Drawing Sheets



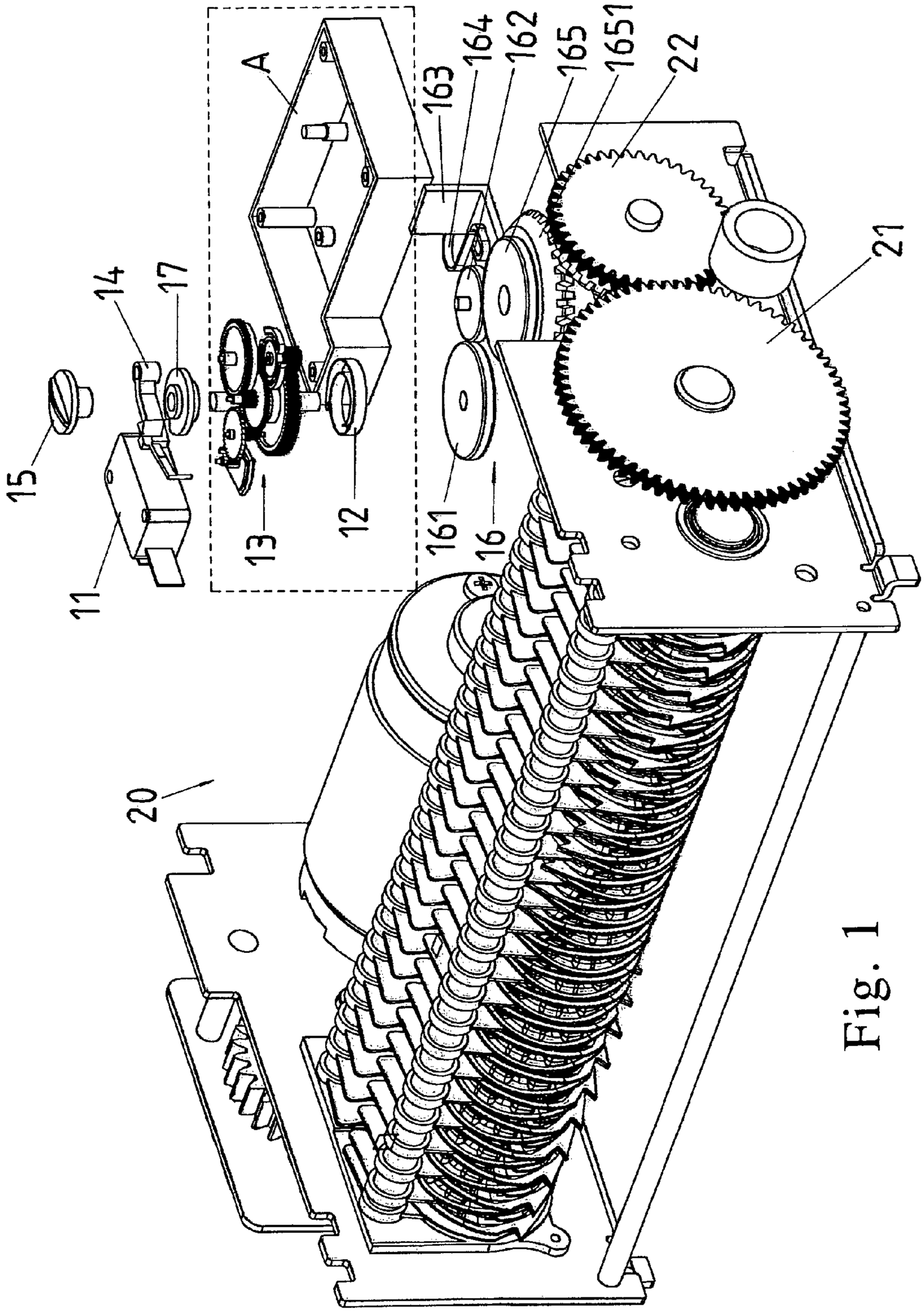


Fig. 1

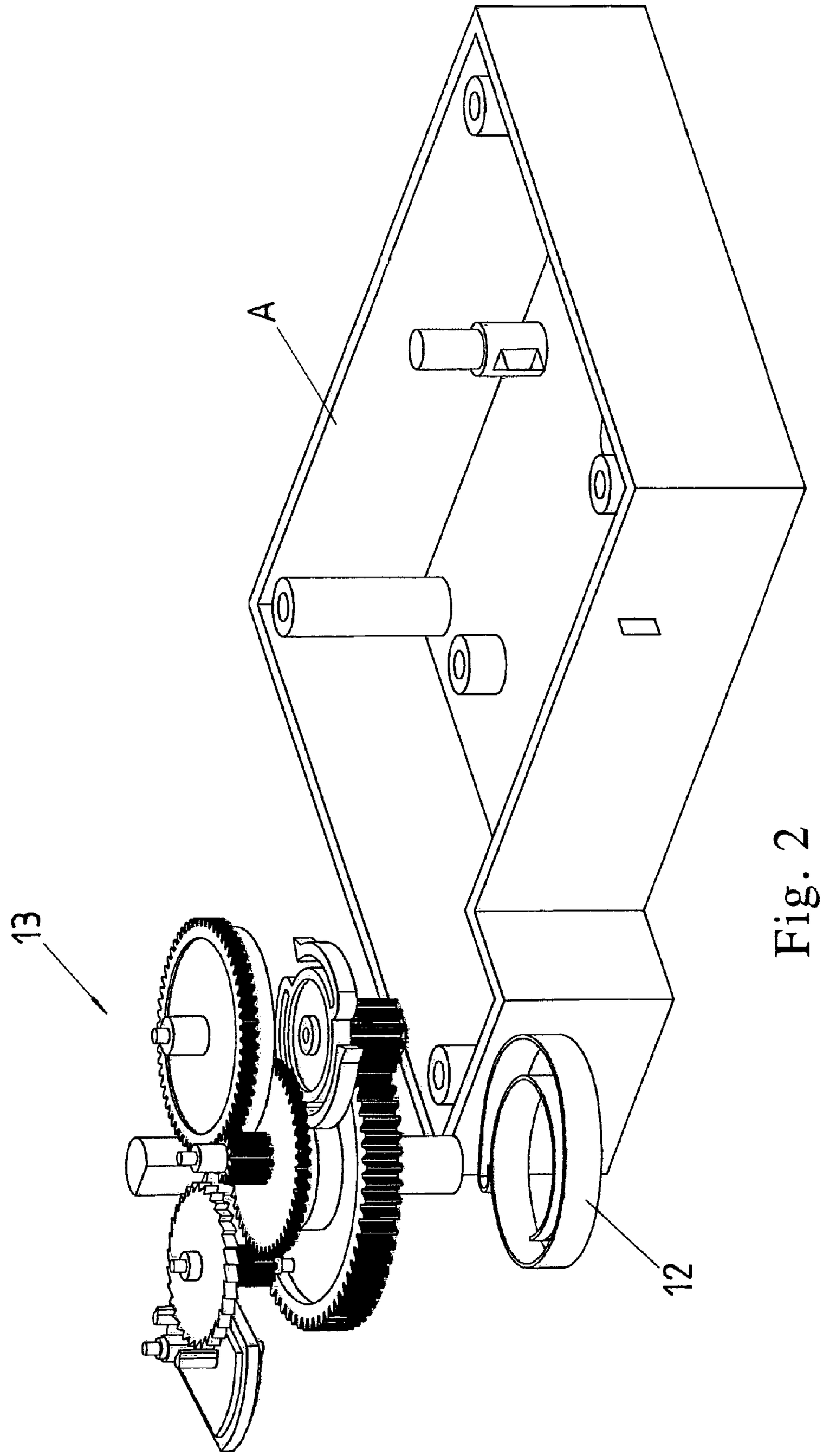


Fig. 2

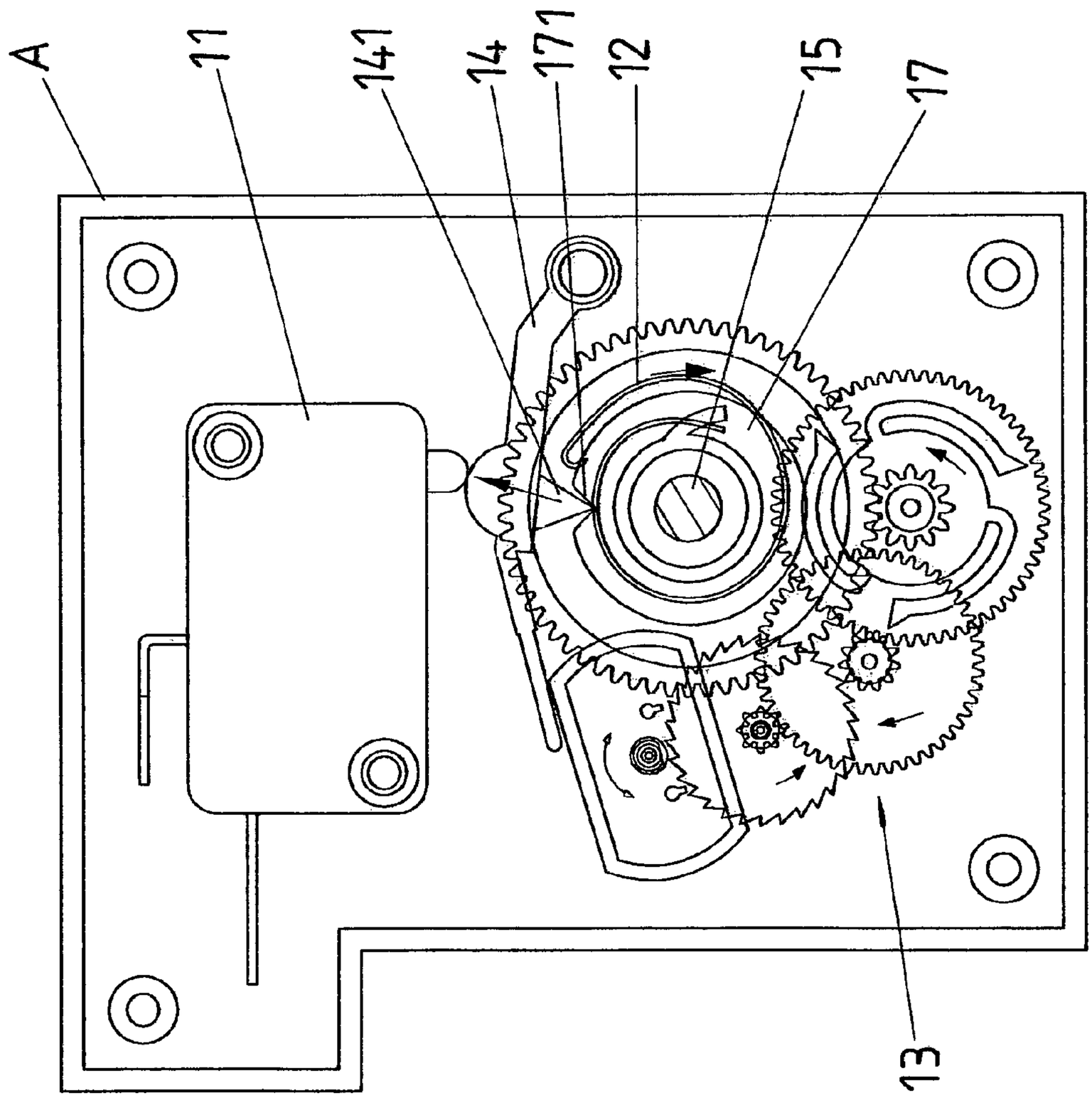


Fig. 3

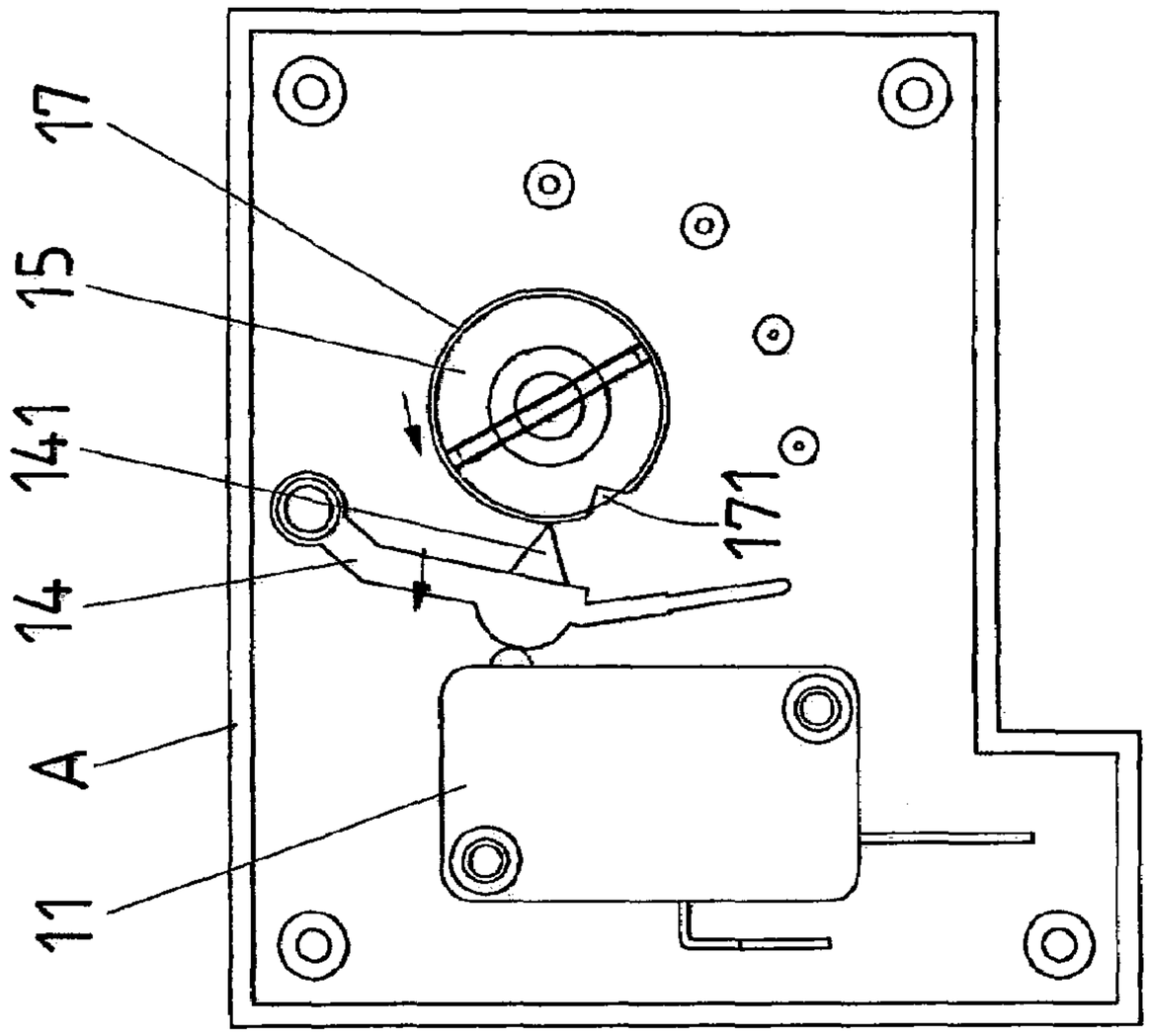


Fig. 5

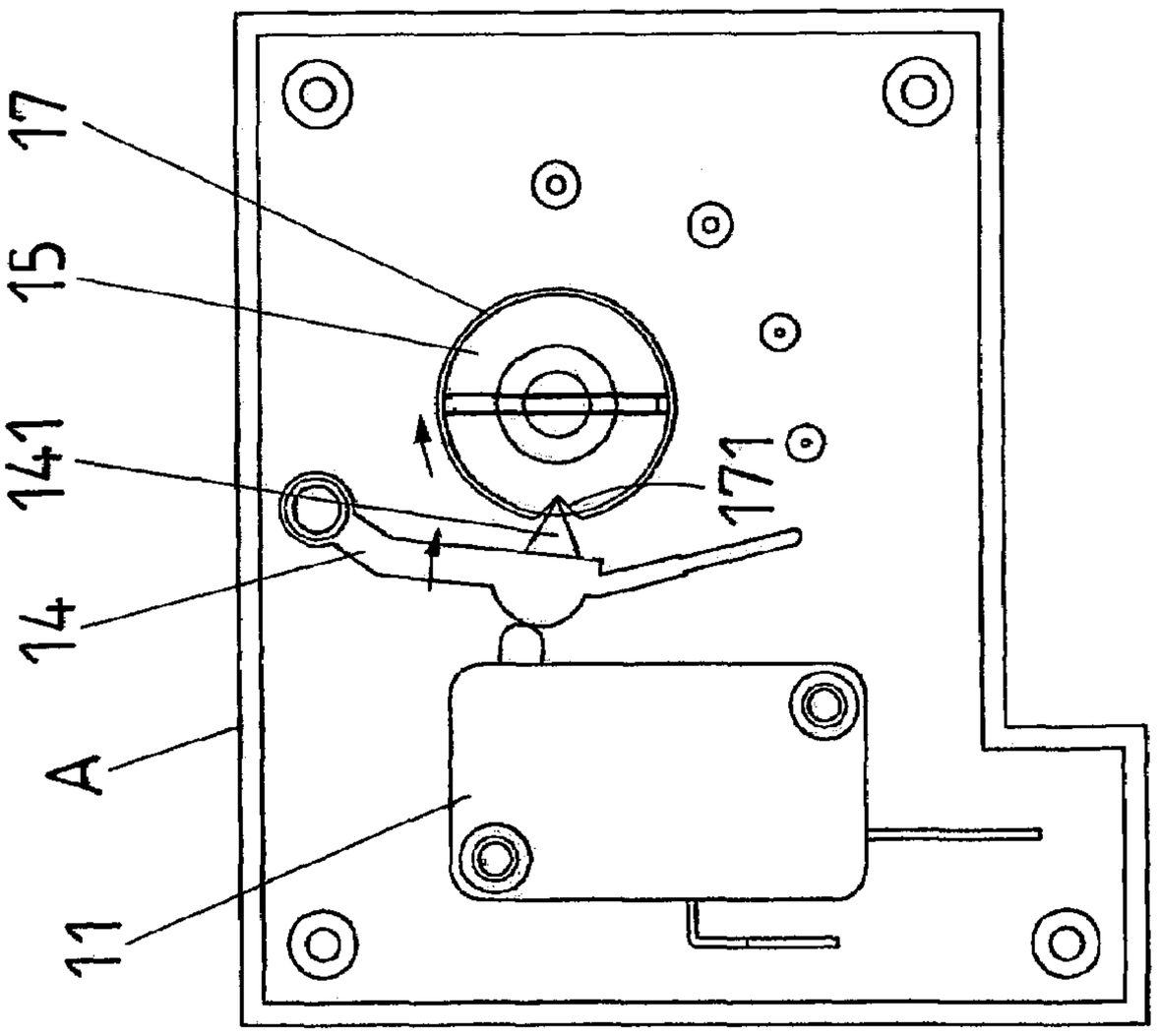


Fig. 4

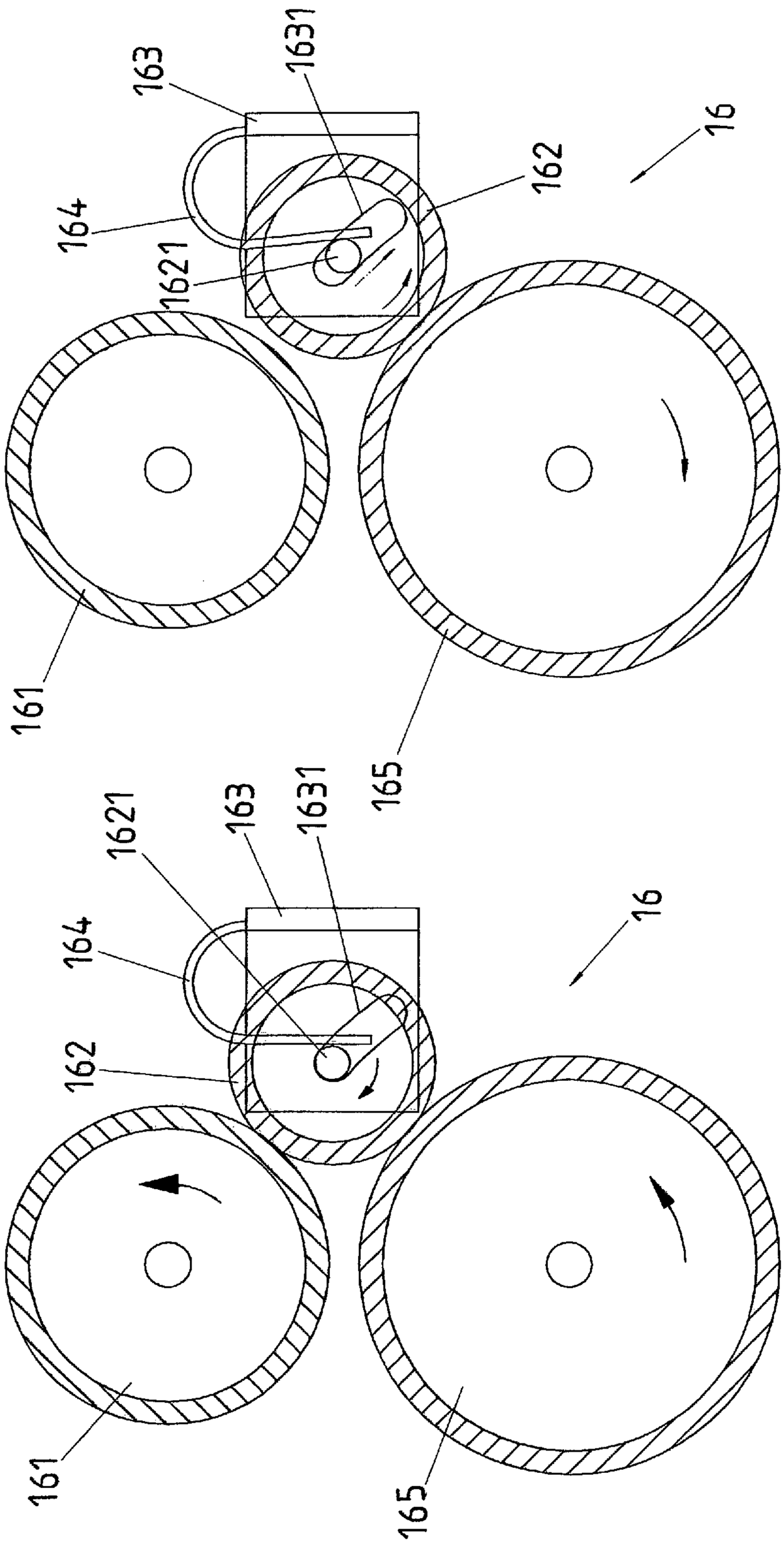

163
1631
16
162
164
1621
161
165

Fig. 7

1621
163
1631
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16
162
161
165

Fig. 6

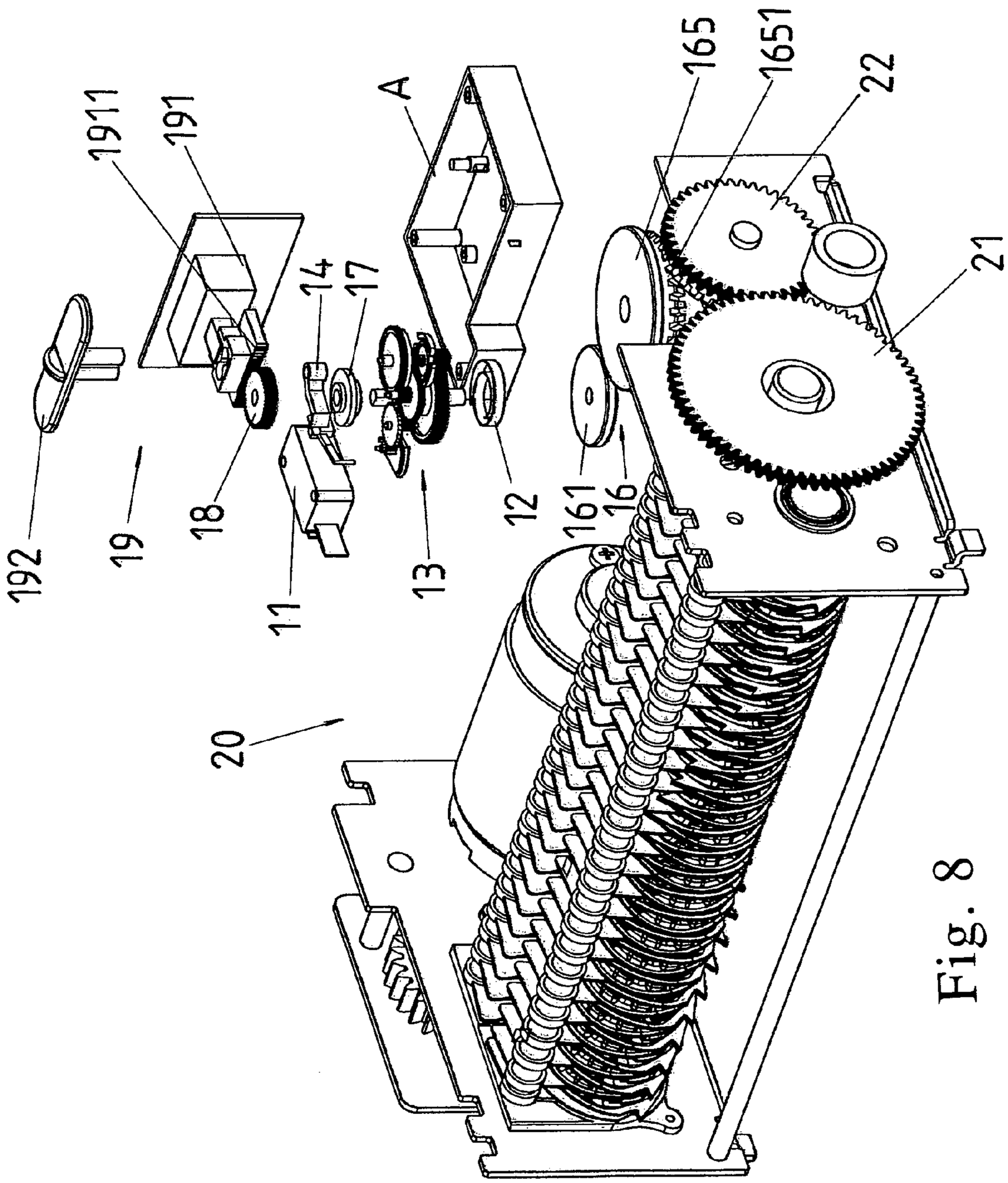

Fig. 8

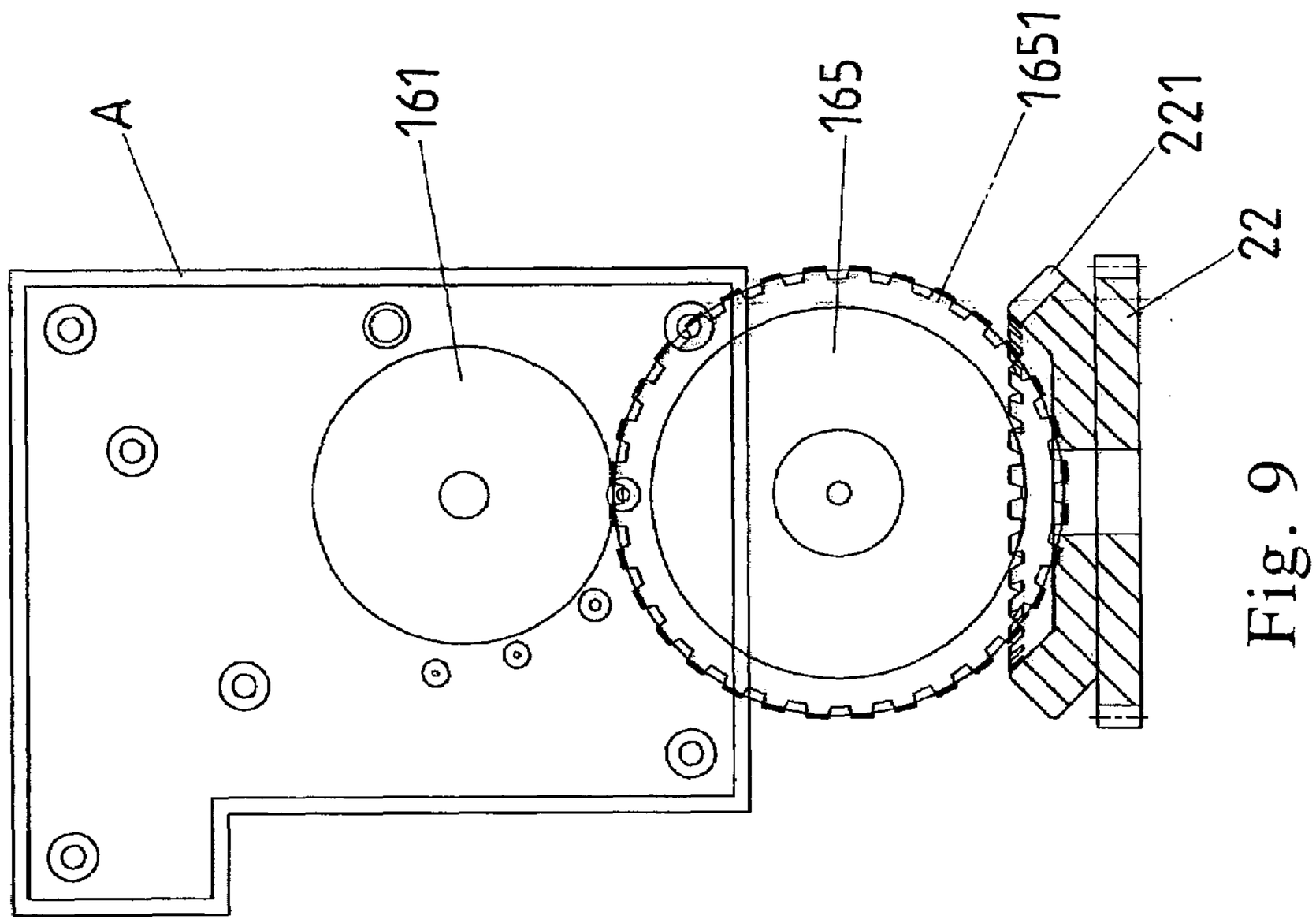

Fig. 9

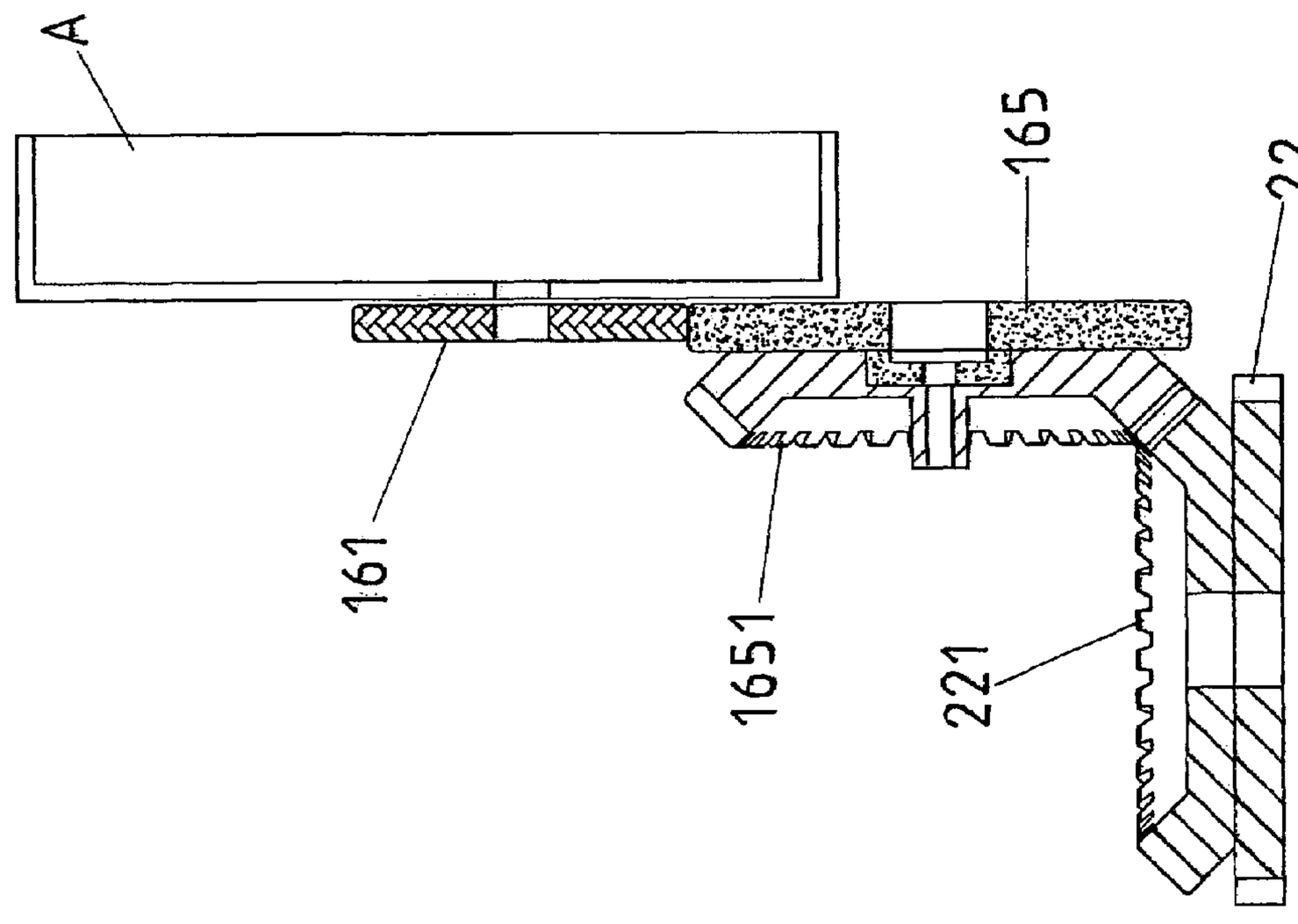

Fig. 10

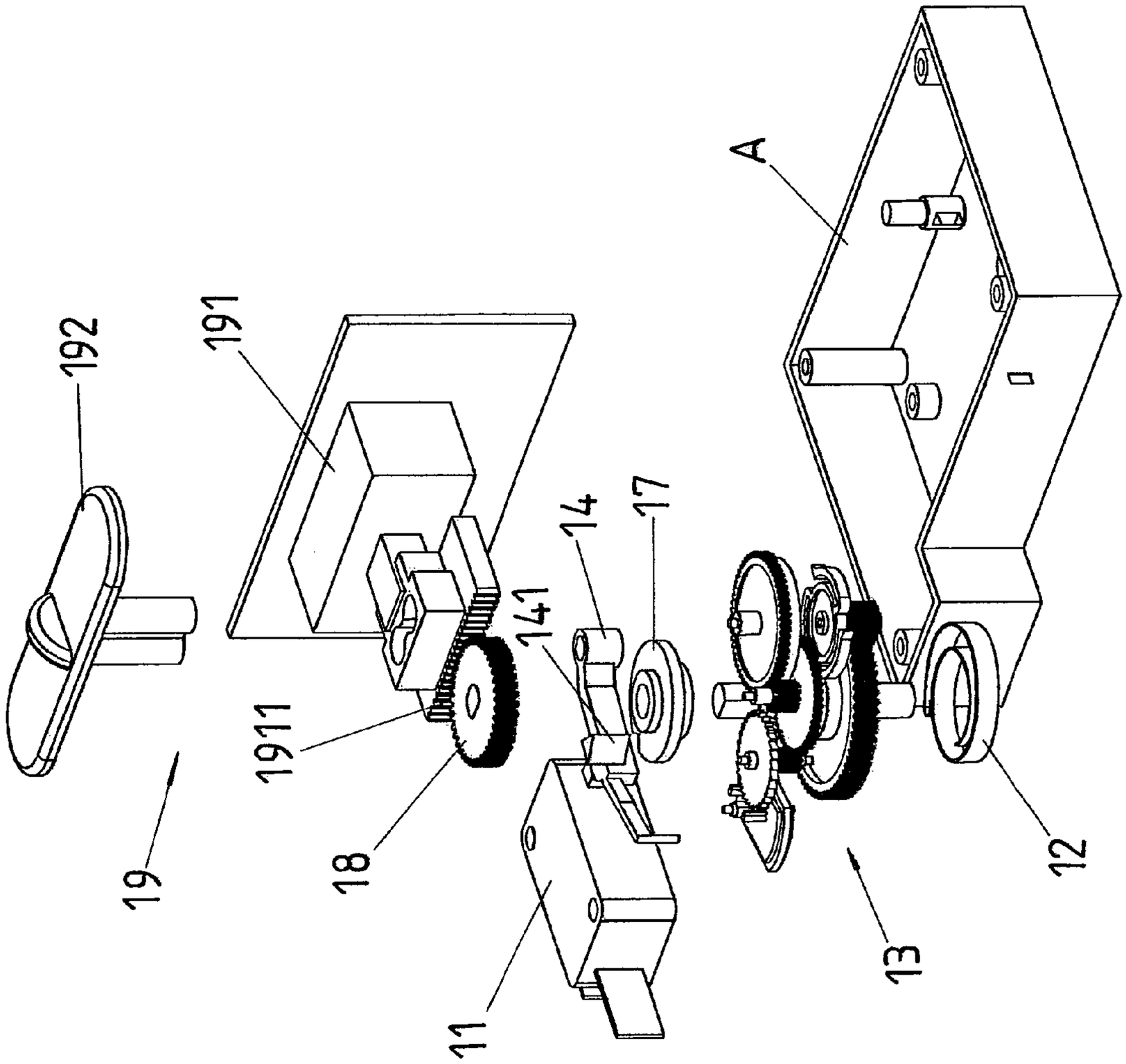

Fig. 11

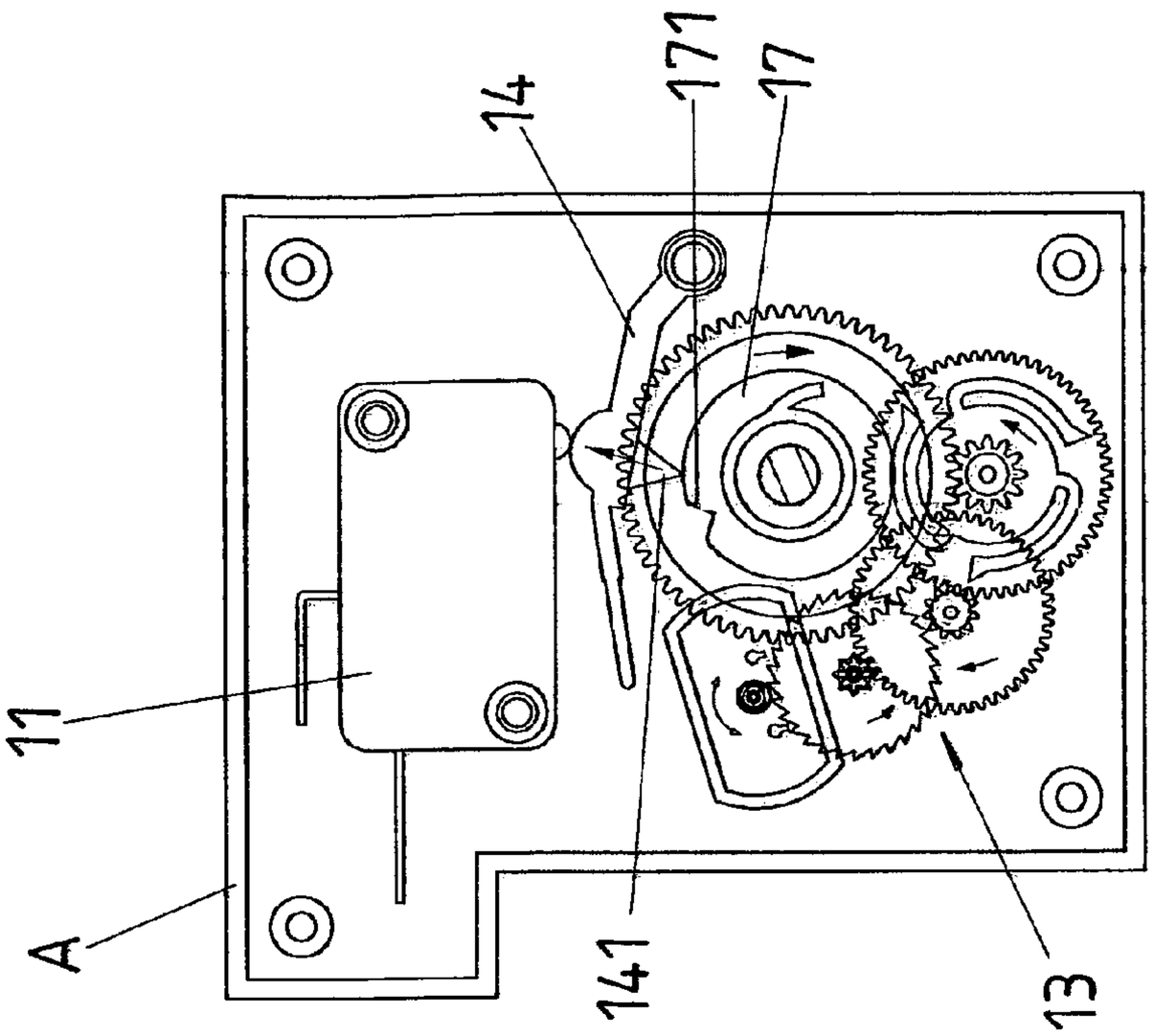

Fig. 13

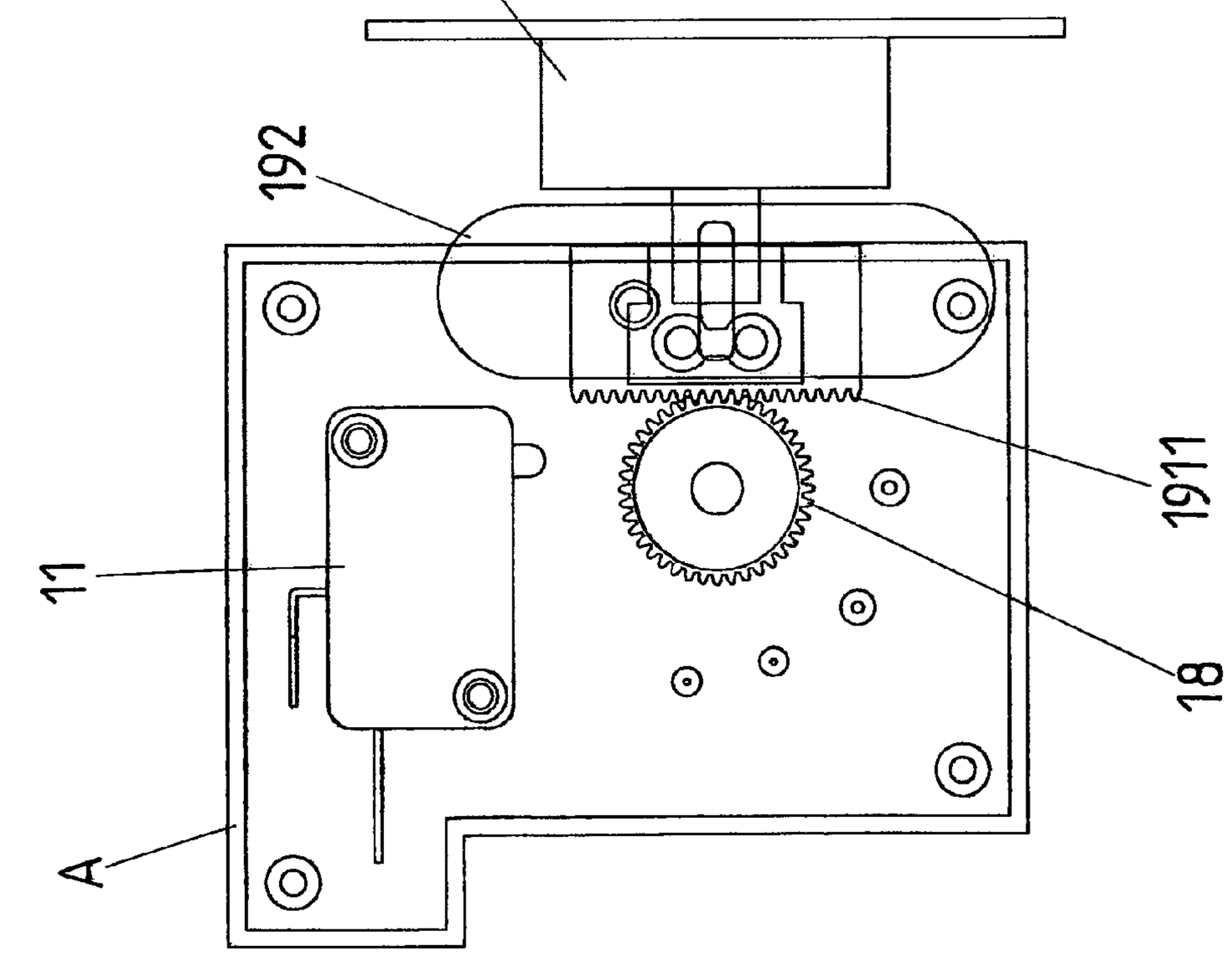

Fig. 12

AUTO ELECTRICITY BREAKER FOR SHREDDERS

BACKGROUND OF THE INVENTION

1. Field of Invention

The invention relates to a safety breaker for shredders and, in particular, to an electricity breaker that automatically shuts down the power of a shredder when its cutting blade ensemble stops operation for some time in order to save energy and provide protection.

2. Related Art

To prevent confidential files or data from being released to irrelevant people, they are usually destroyed by shredders. Therefore, the shredder has become an indispensable device in business and home life.

The action principle of most well-known shredders for shredding paper is to utilize several cutting blades along with spacers installed on two parallel rotary shafts that are driven by a motor and a gear box to rotate in opposite directions. A shearing force thus imposes on passing paper and cuts it into thin stripes. According to the mechanical cutting modes, shredders are divided into two types: stripe-cut shredders and cross-cut shredders. In the former case, the cutting blades are disposed regularly on the rotary shafts and cut the paper along the longitudinal direction into long stripes. Each blade on the latter has several hook-shaped cutting edge. The blades are disposed in a spiral way on the rotary shafts. In this case, the paper is not only cut along the longitudinal direction into stripes, but also cut in the transverse direction into chips.

The above-mentioned stripe-cut or cross-cut shredder basically comprises a cutting blade ensemble and relevant components. During the operation of the cutting blade ensemble, paper passing through the rotary shafts is shredded into tiny stripes or chips. The housing of the shredder is usually provided with a sliding switch (power switch) for switching among the auto, rev, or off mode. However, when the sliding switch is in the auto mode, the control circuit inside the shredder is still on even no paper is fed into the cutting blade ensemble. This causes unnecessary waste of electricity. Moreover, sensors can be mis-triggered to result in danger.

SUMMARY OF THE INVENTION

An objective of the invention is to provide an electricity breaker that automatically turn off the power of the shredder after the cutting blade ensemble stops operation for some time to achieve energy-saving and protection functions.

To achieve the above objective, the disclosed auto electricity breaker includes a breaker switch that controls the power of the shredder, an energy storage device driven by a cutting blade ensemble, a variable gear set driven by the energy storage device, a trigger driven by the variable gear set to turn on the breaker switch, and a starting switch for restoring the trigger. The energy storage device stores energy concurrently during the operation of the cutting blade ensemble. When the cutting blade ensemble stops operation, the variable gear set is driven to operate. When the variable gear set operates to a certain extent, the trigger takes action to turn on the breaker switch. The breaker switch breaks the electrical power of the shredder to stop its operation. Therefore, it saves energy and provides protection.

The user can turn on the starting switch for restoring the trigger and thus turn on the power of the shredder again for normal operation. The breaker then resumes its auto electricity breaker function.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will become more fully understood from the detailed description given herein below illustration only, and thus is not limitative of the present invention, and wherein:

FIG. **1** is an exploded view of the disclosed auto electricity breaker;

FIG. **2** shows the structure of the disclosed variable gear set;

FIG. **3** is a planar view of the disclosed auto electricity breaker;

FIG. **4** is a schematic view showing the state that the power of the invention is off;

FIG. **5** is a schematic view showing the state that the power of the invention is on;

FIG. **6** is a schematic view showing the disclosed one-way mechanism in a transmissions state;

FIG. **7** is a schematic view showing the disclosed one-way mechanism in a transmissions state;

FIG. **8** is an exploded view of the auto electricity breaker according to the second embodiment of the invention;

FIG. **9** is a schematic front view showing the transmission of the first and second fixed frictional wheels according to the second embodiment;

FIG. **10** is a schematic side view showing the transmission of the first and second fixed frictional wheels according to the second embodiment;

FIG. **11** is an exploded view of the variable gear set, the energy storage device, and the switch ensemble in the second embodiment;

FIG. **12** is a schematic view showing the transmission of the push switch and the third transmission gear in the second embodiment; and

FIG. **13** schematically shows the action of the trigger in the second embodiment.

DETAILED DESCRIPTION OF THE INVENTION

The present invention will be apparent from the following detailed description, which proceeds with reference to the accompanying drawings, wherein the same references relate to the same elements.

As shown in FIGS. **1**, **2**, and **3**, the disclosed auto electricity breaker for shredders includes: a breaker switch **11**, an energy storage device **12**, a variable gear set **13**, a trigger **14**, a starting switch and a base A.

The base A is provided for the installation of relevant components of the auto electricity breaker. The breaker switch **11** controls the power supply to the shredder. The energy storage device **12** is driven by the cutting blade ensemble **20** of the shredder to store energy. The variable gear set **13** receives the energy released by the energy stroage device **12** and rotates. The trigger **14** is driven by the variable gear set **13** to turn on the breaker switch **11**. The starting switch can be a knob **15**, as shown in the drawing, for restoring the trigger **14**.

In an embodiment, the energy storage device **12** is a spiral spring connected with the variable gear set **13**. During the operation of the cutting blade ensemble **20**, the energy storage device **12** (i.e., the sprial spring) is driven concurrently by the cutting blade ensemble **20** to store energy. With reference to FIGS. **4** and **5**, the knob **15** and a dial **17** are connected with the output axis of the variable gear set **13**. The edge of the dial **17** has a notch **171**. The trigger **14** has a hook **141** corresponding to the notch **171**. When the cutting blade ensemble stops its operation, the energy storage device (spiral spring) moves inversely to drive the variable gear set into operation. When

the variable gear set rotates to a certain extent, the dial **17** rotates to a position where the hook **141** of the trigger **14** falls right into the notch **171**. In this case, the breaker switch **11** breaks the electrical power of the shredder, achieving the effects of saving energy and providing protection.

When one turns the knob **15** to rotate the dial **17**, the hook **141** of the trigger **14** retreats from the notch **171** of the dial **17**, thereby restoring the trigger **14**. The electrical power of the shredder is turned on again to start its normal operation. The electricity breaker also resumes its auto electricity breaker function.

It should be mentioned that the disclosed energy storage device establishes transmission with the cutting blade ensemble via a one-way mechanism, as shown in FIG. **1**. The one-way mechanism **16** includes: a first fixed frictional wheel **161** disposed in the energy storage device **12** and establishing transmission with it, a second fixed frictional wheel **165** disposed in the cutting blade ensemble **20** and establishing transmission with it, a gloating frictional wheel **162** disposed between the first and second fixed frictional wheels **161**, **165**, a groove **163** for the floating frictional wheel **162** to move relative to the first and second fixed frictional wheels **161**, **165**, and an elastic element **164** that pushes the floating frictional wheel **162** toward the first and second fixed frictional wheels **161**, **165**.

The axis of the second fixed frictional wheel **165** is provided with a first transmission gear **1651**. The first transmission gear forms a transmission connection with a primary gear **21** at the rotary shaft of the cutting blade ensemble **20** via a second transmission gear **22**. As shown in FIGS. **6** and **7**, the groove **163** has an arc groove **1631** along the cruved arc of the second fixed frictional wheel **165**. The axis **1621** of the floating frictional wheel **162** goes into the arc groove **1631** of the groove **163**. When the cutting blade ensemble rotates in the forward direction, the floating frictional wheel **162** ensures the transmission between the first and second fixed frictional wheels **161**, **165**. The energy storage device is driven by the cutting blade ensemble to store energy. When the cutting blade ensemble rotates backward, the floating frictional wheel **162** departs from one of the first fixed frictional wheel **161**, so that there is no transmission between the two fixed frictional wheels **161**. In this case, the energy storage device does not operate with the cutting blade ensemble. This prevents the energy storage device from releasing energy in an abnormal way. The electricity breaker indeed has the function of automatically breaking the electricity.

Besides, the starting switch composed of the knob **15** in the above embodiment can be replaced by the push switch **192** in FIG. **8**. The push switch **192** can be integrated with the switch ensemble **19** of the shredder. As shown in FIGS. **8** and **11**, the push switch **192** is integrated with the slide switch **191** of the shredder into a switch ensemble **19**. The transmission between the energy storage device and the cutting blade ensemble is achieved by a first fixed frictional wheel **161** disposed at the energy storage device **12** for transmission and a second fixed frictional wheel **165** disposed at the cutting blade ensemble **20** for transmission.

Please refer to FIGS. **8**, **9**, and **10** simultaneously. The axis of the second fixed frictional wheel **165** is provided with a first transmission gear **1651**. The first transmission gear forms a transmission connection with a primary gear **21** at the rotary shaft of the cutting blade ensemble **20** via a second transmission gear **22** that has an inner gear **221**. When the cutting blade ensemble rotates forward, the energy storage device is driven by the cutting blade ensemble to store energy through the transmission of the first and second fixed frictional wheels **161**, **165**.

As shown in FIGS. **8**, **12**, and **13**, the push switch **192** forms transmission with a third transmission gear **18** between the dial **17** and the variable gear set **13** via a saw bar **1911**. The edge of the dial **17** is formed with a notch **171**. The trigger **14** has a hook **141** corresponding to the notch **171**. When the cutting blade ensemble stops operation, the energy storage device (spiral spring) moves backward and drives the variable gear set. Once the variable gear set operates to a certain extent, the dial **17** rotates to a position so that the hook **141** of the trigger **14** falls into the notch **171**. The electricity breaker **11** thus breaks the power to the shredder, achieving the goals of saving energy and providing protection.

The user can push the push switch **192** to rotate the dial **17**, backing the hook **141** of the trigger **14** out of the notch **171** of the dial **17**. This restores the trigger **14** to its original position. The power of the shredder is turned on again for normal operation. The electricity breaker also resumes its auto electricity breaker function.

Although the invention has been described with reference to specific embodiments, this description is not meant to be construed in a limiting sense. Various modifications of the disclosed embodiments, as well as alternative embodiments, will be apparent to persons skilled in the art. It is, therefore, contemplated that the appended claims will cover all modifications that fall within the true scope of the invention.

What is claimed is:

1. An auto electricity breaker for a shredder, comprising:

a base;

a breaker switch for controlling the electrical power to the shredder;

an energy storage device driven by a cutting blade ensemble of the shredder to store energy;

a variable gear set driven by the energy released from the energy storage device;

a trigger driven by the variable gear set to trigger the breaker switch; and

a starting switch for restoring the trigger;

wherein the energy storage device releases its stored energy when the cutting blade ensemble stops its operation and drives the variable gear set into operation; the variable gear set drives the trigger when it rotates to a certain extent; the trigger releases the breaker switch to break the electrical power to the shredder; and when the electrical power of the shredder is turned on again, the starting switch restores the trigger to its original position so that the shredder starts its normal operation and the electricity breaker resumes its auto electricity breaking function.

2. The auto electricity breaker for a shredder of claim **1**, wherein the energy storage device comprises a spiral spring connected with the variable gear set.

3. The auto electricity breaker for a shredder of claim **1**, wherein the starting switch is a knob in connection with a dial and an output axis of the variable gear set, the edge of the dial has a notch, and the trigger has a hook corresponding to the notch.

4. The auto electricity breaker for a shredder of claim **1**, wherein the energy storage device forms transmission with the cutting blade ensemble via a one-way mechanism.

5. The auto electricity breaker for a shredder of claim **1**, wherein the one-way mechanism further includes:

a first fixed frictional wheel fixed at the energy storage device for transmission;

a second fixed frictional wheel fixed at the cutting blade ensemble for transmission;

a floating frictional wheel disposed between the two fixed frictional wheels;

a groove for the floating frictional wheel to move relative to the two fixed frictional wheel; and

an elastic element for pushing the floating frictional wheel toward the two fixed wheels.

6. The auto electricity breaker for a shredder of claim **5**, wherein the axis of the second fixed frictional wheel is provided with a first transmission gear, the first transmission gear forms transmission with a primary gear at the axis of the cutting blade ensemble via a second transmission gear that has an inner gear, the groove has an arc groove along the curved arc of the second fixed frictional wheel, and the axis of the floating frictional wheel goes into the arc groove of the groove.

7. The auto electricity breaker for a shredder of claim **1**, wherein the starting switch is a push switch that forms transmission with a third transmission gear that connects a dial and an output axis of the variable gear set via a saw bar, the edge of the dial is formed with a notch, and the trigger has a hook corresponding to the notch.

8. The auto electricity breaker for a shredder of claim **7**, wherein the transmission between the energy storage device and the cutting blade ensemble is achieved by a first fixed frictional wheel disposed at the energy storage device for transmission and a second fixed frictional wheel disposed at the cutting blade ensemble for transmission, the axis of the second fixed frictional wheel is provided with a first transmission gear, and the first transmission gear forms transmission with a primary gear at the axis of the cutting blade ensemble via a second transmission gear.

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